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(54) Method and apparatus for reproducing picture data.

(57) Apparatus for reproducing picture data includes a variable length decoder and Huffman decoder (22), an inverse discrete cosine transforming (IDCT) unit (23) coupled to the Huffman decoder, an intra-frame prediction unit and motion compensation unit (24) coupled to the IDCT unit, a memory (25) coupled to the intra-frame unit, a buffer memory (26) coupled to an output of the intra-frame unit, a resolution changer (41) coupled to the buffer memory, a frames in/out unit (42) coupled to the output of the resolution changer, a unit (43) for changing a timetable of picture frames coupled to the output of the frames in/out unit, a frame memory (44) coupled to the changing unit, and a selector (31) for selecting picture data for reproduction from the buffer memory or the changing unit.

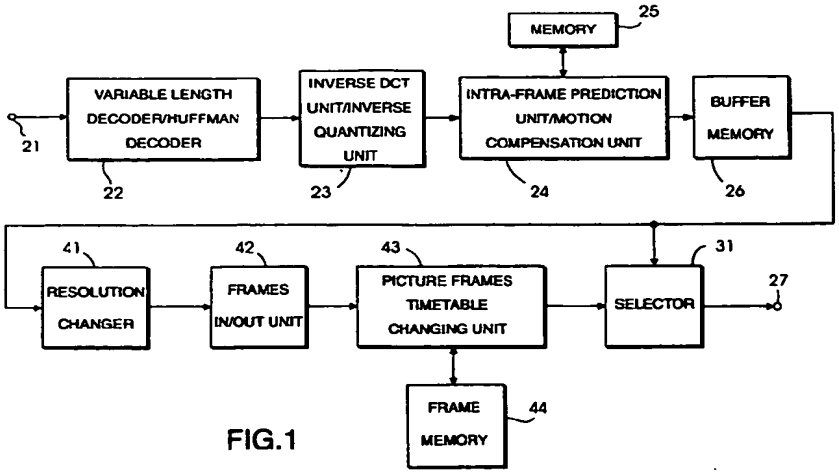

FIG.1

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The present invention relates to a method of, and apparatus for, reproducing picture data.

Figure 9(A) shows a known apparatus for reproducing picture data from a storage medium for displaying on a monitor. Figure 9(B) shows in more detail the decoder that expands and decodes compressed picture data, shown in Figure 9(A). As shown in Figures 9(A) and 9(B), a motion picture storage unit 11 includes a storage medium and a reproducing unit. A signal from motion picture storage unit 11 is input to a pre-processing unit 12. Pre-processing unit 12 amplifies and equalizes the signal from unit 11. The signal from pre-processing unit 12 is provided to a demodulator 13. Demodulator 13 demodulates the signal from unit 12. The signal from demodulator 13 is provided to an error correction unit 14. The signal from demodulator 13 is error corrected by error correction unit 14 in conjunction with a memory 15. The signal from error correction unit 14 is expanded and decoded by an expand/decode unit 16 to picture data in R, G, B format, or picture data in Y/Cb/Cr format, or picture data in CMYK format. The picture data is provided to a video signal encoder 17. The picture data from the expand/decode unit 16 is changed to a video signal (PAL or NTSC etc) in a video signal encoder 17. The video signal is then provided to a D/A converter 18, where it is converted to an analog video signal. The analog video signal from D/A converter 18 is provided to a display monitor 19. Display monitor 19 displays the video signal.

Figure 9(B) shows in more detail the expand/decode unit 16 in Figure 9(A). The compressed picture data received on input terminal 21 is provided to a variable length decoder and Huffman decoder 22. The compressed picture data is decoded in the variable length decoder and Huffman decoder 22. The picture data from the variable length decoder and Huffman decoder 22 is applied to an inverse discrete cosine transforming unit and inverse quantizing unit 23. The picture data is inverse discrete cosine transformed and inverse quantized in the inverse discrete cosine transforming unit and inverse quantizing unit 23. The picture data from the inverse discrete cosine transforming unit and inverse quantizing unit 23 is provided to an intra frame prediction unit and motion compensation unit 24. The picture data is predicted and compensated in conjunction with a memory 25 for intra frame prediction in the intra frame prediction unit and motion compensation unit 24. The picture data from the intra frame prediction unit and motion compensation unit 24 is output on an output terminal 27 through a buffer memory 26 for picture displaying.

Variable length decoding and Huffman decoding restores compressed picture data by entropy coding. Inverse discrete cosine transforming restores compressed data by direct-alternating interchange. Inverse quantizing restores quantized compressed data. Intra-frame coding is a method of forming an estimated picture by making use of the relationship between a picture and an adjoining block of the same frame. This coding is effective for compressing when a picture is simple. Inter-frame prediction coding is a method of forming an estimated picture by making use of a picture of an adjoining frame. This coding is effective for high compression when a moving picture experiences only a small amount of movement. A method known as "H.261" of ITU (International Telecommunication Union) can be employed to make use of estimated frames. A method of MPEG1 and 2 (Moving Picture Experts Group Phase1 and Phase2) allows use of bidirectionally predicted frames.

As stated above, reproducing and inverse reproducing are often required. Conventially, a simple method of inverse reproducing can be practiced by providing memory between the expand/decode unit 16 and the video signal encoder 17. Some frames of picture data are stored in the memory, and the frames are reproduced in inverse frame order. In the case of the H.261 method, it is necessary to maintain picture data for at least a part of the refresh cycle. In the case of the MPEG methods, it is necessary to maintain picture data of one unit of a prescribed GOP (Group of Pictures). This is because it is not possible to reproduce picture data without using comparative picture data. Also it is necessary to change the order in which the picture data were stored.

Accordingly, the invention is directed to a method of reproducing a picture and apparatus for reproducing picture data that substantially obviates one or more problems due to limitations and disadvantages of the related art.

To achieve the advantages of the invention and in accordance with the purpose of the invention, as embodied and broadly described below, the invention is directed to an apparatus for reproducing picture data. The apparatus comprises means for decoding compressed picture data; a changer of resolution to change a resolution of the decoded picture data; a memory for storing the picture data with changed resolution; means for reproducing the picture data from the memory; and means for controlling an order for reproducing the picture data from the memory.

Further, in accordance with the present invention there is provided apparatus for reproducing picture data. The apparatus comprises means for receiving compressed picture data compressed by inter-frame prediction coding; means for decoding the compressed picture data; a changer of resolution for decreasing a size of the picture data by

decreasing resolution; means for omitting frames from the picture data from the changer of resolution; means for changing an order of the picture data; and means for selecting the picture data from one of the means for changing an order and the means for decoding, to reproduce the picture data.

Also in accordance with the present invention, there is provided a method for reproducing picture data, comprising the steps of decoding compressed picture data; storing in memory the picture data with changed resolution; reproducing the picture data from the memory; and controlling an order for reproducing the picture data from the memory.

For a better understanding of the present invention, reference will now be made, by way of example, to the accompanying drawings, in which:

Fig. 1 is a diagrammatic illustration of apparatus for performing picture data reproduction in accordance with an embodiment of the invention.

Fig. 2 is a diagrammatic illustration of apparatus for performing picture data reproduction in accordance with another embodiment of the invention.

Fig. 3 is a diagrammatic illustration of apparatus for picture data reproduction in accordance with a further embodiment of the invention.

Fig. 4 is a diagrammatic illustration of apparatus for performing picture data reproduction in accordance with an additional embodiment of the invention.

Fig. 5 is a diagrammatic illustration showing processing of compressed coded picture data according to an MPEG standard.

Fig. 6(A) diagrammatically illustrates a memory map of memories shown in Fig. 1, and Fig. 6(B) diagrammatically illustrates a memory access map.

Fig. 7(a) illustrates a memory map of a memory illustrated in Fig. 2, and Fig. 7(B) shows a memory access map of the memory in Fig. 2.

Fig. 8(A) shows a memory map of a memory illustrated in Figs. 3 and 4, and Fig. 8(B) shows a memory access map for the memory shown in Figs. 3 and 4.

Fig. 9(A) shows apparatus for reproducing picture data from a storage medium for display, and Fig. 9(B) is a diagrammatic illustration of a decoder included in apparatus shown in Fig. 9-(A).

Preferred embodiments of the invention will be described with reference to the drawings.

Figure 1 shows an apparatus constructed in accordance with the invention and for carrying out a method of the invention. Compressed data in MPEG format are inputted to input terminal 21. The compressed data is provided to a variable length decoder and Huffman decoder 22. The compressed data is decoded by the variable length decoder and Huffman decoder 22, and is provided to an inverse discrete cosine transforming unit and inverse quantizing unit 23. Data from the variable length decoder and Huffman decoder 22 is inverse discrete cosine transformed and inverse quantized in the inverse discrete cosine transforming unit and inverse quantizing unit 23. Data from the inverse discrete cosine transforming unit and inverse quantizing unit 23 is provided to an intra frame prediction unit and motion compensation unit 24. The data is predicted and compensated by use of intra frame prediction in the intra frame prediction unit and motion compensation unit 24 in conjunction with a memory 25. The motion compensated data is supplied to a buffer memory 26.

Data from the buffer memory 26 is provided to a resolution changer 41. Resolution changer 41 changes the resolution of the picture data, and hence decreases the size of the picture data.

The picture data from the intra frame prediction unit and motion compensation unit 24, after resolution change in the resolution changer 41, is provided to a frames in/out unit 42. In the frames in/out unit 42, frames of the picture data are omitted from and inserted in to the small sized picture data from the resolution changer 41 to increase and decrease the number of frames to control the speed of reverse reproducing.

The order of the frames is decided by a picture frames timetable changing unit 43 and the frame memory 44. The frames from the picture frames timetable changing unit 43 are output on the output terminal 27 through a selector 31.

According to the present invention, since the resolution changer 41 changes the resolution of picture data, the amount of picture data to be stored in memory 44 is reduced in quantity during reproduction of pictures including changes in frame order and control of speed of reproduction.

Figure 2 shows another apparatus constructed in accordance with the invention and for carrying out the method of the invention. In Figure 2 elements which are the same as those in Figure 1 are identified by the same reference numerals.

The apparatus in Figure 2 includes a single memory 51 which is used in place of the memory 25 and frame memory 44 of Figure 1.

In reproduction of a picture, picture data processed by intra frame prediction unit and motion compensation unit 24, by use of memory 51, is outputted on output terminal 27 through selector 31 and the picture frames timetable changing unit 43.

At this time, the unit of changing of timetable of picture frames 43 does not change the order of frames.

In reverse reproducing, picture data processed by the intra frame prediction unit and motion com-

pensation unit 24, by use of memory 51, is provided to the resolution changer 41. A picture size of the picture data is changed by the resolution changer 41. The picture data from the resolution changer 41 is provided to the frames in/out unit 42. In the frames in/out unit 42, frames of picture data are removed from or inserted into the small sized picture data from the resolution changer 41 to increase or decrease the number of frames to control the speed of reverse reproducing.

The picture data from the frames in/out unit 42 supplies an input to the picture frames timetable changing unit 43 through selector 31. The order of the picture data is changed in the picture frames timetable changing unit 43 and the memory 51. The picture data from the picture frames timetable changing unit 43 is outputted from output terminal 27.

According to the second embodiment of the present invention, the apparatus for reproducing picture data can be connected with only the single memory 51. As compared with the prior art, the memory 51 needs a lower capacity when the frame order is changed during reproduction and the speed of reproduction is controlled.

Figure 3 shows another apparatus constructed in accordance with the invention and for carrying out a method of the invention. In Figure 3 elements which are the same as those shown in Figure 1 and Figure 2 are identified by the same numerals. In this case, data from the inverse discrete cosine transforming unit and the inverse quantizing unit 23 is provided to one of the selector 31 and the resolution changer 41. Data from the resolution changer 41 is provided to another input of the selector 31. Data from the selector 31 is provided to the intra frame prediction unit and motion compensation unit 24.

The picture data is decoded by the intra frame prediction unit and motion compensation unit 24 by a process in which memory 52 is used. The picture data from the intra frame prediction unit and motion compensation unit 24 is provided to the frames in/out unit 42.

In the frames in/out unit 42, frames of the picture data are omitted or picture data is inserted. The processing by the frames in/out unit 42 utilizes capacity of the memory 52. The picture data from the frames in/out unit 42 is provided to the picture frames timetable changing unit 43. In the picture frames timetable changing unit 43, the order of frames of the picture data is changed, a process in which memory 52 is used, in order to reverse reproduce. The picture data from the picture frames timetable changing unit 43 is output to output terminal 27.

During normal picture reproduction, the picture data from the inverse discrete cosine transforming unit and inverse quantizing unit 23 is output to output terminal 27 through selector 31 without omitting of frames from the picture data or changing the order of the picture data.

In the resolution changer 41 in Figure 3, the picture data is changed in each picture block of one frame. For example, in a frame subdivided into an 8 X 8 grid of 64 picture blocks, resolution changer 41 can reduce the amount of pixel data by deleting a part of the pixel data in each picture block.

Figure 4 shows another apparatus constructed in accordance with the invention and for carrying out a method of the invention. In Figure 4 elements which are the same as those shown in Figure 1, Figure 2 and Figure 3 are identified by the same reference numerals. In this case, the picture data decoded by the variable length decoder and Huffman decoder 22 is supplied to an inverse quantizing unit 61. The picture data which is inverse quantized is provided to a resolution changer and an inverse discrete cosine transforming unit 62. The picture data is changed in resolution and inverse quantized in the resolution changer and inverse discrete cosine transforming unit 62. During normal picture reproduction, the picture data is only inverse discrete cosine transformed in the unit 62 without changing a resolution of the picture.

The picture data from the resolution changer and inverse discrete cosine transforming unit 62 is provided to the intra frame prediction unit and motion compensation unit 24. The picture data is decoded by the intra frame prediction unit and motion compensation unit 24, a process in which the memory 52 is used. The picture data from the intra frame prediction unit and motion compensation unit 24 is provided to the frames in/out unit 42.

In the frames in/out unit 42, frames of picture data are removed from and inserted into the small sized picture data to increase and decrease the number of frames to control the speed of reverse reproducing. The picture data from the frames in/out unit 42 is provided to the picture frames timetable changing unit 43. In the picture frames timetable changing unit 43, the order of frames of the picture data is changed, by use of memory 52, in order to inverse reproduce. The picture data from the picture frames timetable changing unit 43 is outputted to the output terminal 27.

According to the present invention, the picture data is changed in resolution and is also inverse quantized. Changing of picture size in the inverse discrete cosine transforming step is equivalent to a filtering process, and thus it is not necessary to process by digital filtering after changing picture size. It is not necessary to have exclusive hardware for changing of picture size, and so it is effective to reduce the size of the circuit. For example, the

picture data that a low level of a coefficient of DCT (4 by 4 picture elements) selected from the picture data that inverse quantized as 1 block composed of 8 by 8 picture elements. The 4 by 4 picture elements are inverse discrete cosine transformed. It is possible to change picture size on account of preparing of brightness according to a rate of reduction. This art of changing of picture size is described in "INTERFACE Jan 1993" in Japan incorporated herein by reference. The art of MPEG1 and 2 (Moving Pictures Experts Group Phase1 and Phase2) is described in "INTERFACE Aug 1992" in Japan incorporated herein by reference.

A further explanation regarding the capacity of memory and a form of using memory in Figures 1-4 is described next. Referring to Figure 5, there is shown how to decompress coding of each frame when reproducing compressed coding picture data according to an MPEG standard, wherein the I frame is an intra-frame coded picture, the P frame is predictive-picture, and the B frame is a bidirectionally predictive-picture.

In reproduction, no reference picture is required to reproduce the I frame. A P frame is reproduced from an I frame and P frame that precede it as reference picture. A B frame is reproduced from two I frames, I and P frames, or two P frames that precede and follow the B frame as two reference pictures. Figure 5 shows in dashed lines the frames which are used to derive other frames.

Accordingly, it is necessary to provide sufficient memory capacity for at least two frames of picture data to store reference picture data for decoding all frames. It is also necessary to have a buffer memory of about one frame for storing the balance of output picture data and controlling decoding times.

In view of the above, a memory capacity and a form of using memory is determined. Figure 6(A) shows a memory map of memory 25, frame memory 44 and buffer memory 26 in Figure 1. Figure 6-(B) shows a memory access map. This is an example in which only 1/4 of the normal memory capacity is required for each frame, on account of the change of resolution. The memory capacity required to reproduce a frame is reduced to 1/4 the capacity that would be required if the resolution were not changed.

Figure 7(A) shows a map of memory 51 when reproducing and special reproducing in Figure 2. Figure 7(B) shows a memory access map when reproducing and special reproducing in Figure 2. This is an example where the capacity of the output buffer is used as picture memory for some low resolution picture.

Figure 8(A) shows a map of memory 52 when reproducing and special reproducing in Figure 3 and Figure 4. Figure 8(B) shows a memory access map when reproducing and special reproducing in Figure 3 and Figure 4. This is an example in which the resolution of picture data is changed following the IDCT block 23. Memory 52 has the capacity to store many frames, for example 10 frames in Figure 8, because the amount of memory required for decoding each frame is small.

Thus, according to the present invention, it is possible to provide small scale hardware which nevertheless allows reverse reproduction.

Claims

1. An apparatus for reproducing picture data, comprising:
   means for decoding compressed picture data;
   means for changing a resolution of said decoded picture data;
   a memory for storing said picture data with changed resolution;
   means for reproducing said picture data from said memory; and
   means for controlling an order in which said picture data are recalled from said memory for reproduction.

2. An apparatus as claimed in claim 1, further comprising:
   means for receiving compressed picture data compressed by inter-frame/intra-frame prediction coding;
   means for omitting and inserting frames of said picture data from said changed resolution picture data;
   means for changing an order of said picture data; and
   means for selecting for reproduction said picture data from one of said means for changing an order and said means for decoding.

3. An apparatus as claimed in claim 1, further comprising:
   means for receiving compressed picture data compressed by inter-frame/intra-frame prediction coding;
   a memory coupled to said means for decoding;
   means for omitting and inserting frames of said picture data from said changed resolution picture data;
   means for selecting for reproduction said picture data from one of said means for omitting frames and said means for decoding; and
   means, coupled to said selecting means, for changing an order of said picture data by use of said memory to reverse reproduce said picture data.

4. An apparatus as claimed in claim 1, further comprising:

means for receiving compressed picture data that is variable length encoded to estimate in frames/between frames and discrete cosine transformed and quantized;

means for inverse quantizing said compressed picture data;

means for inverse discrete cosine transforming said compressed picture data;

wherein the means for decoding compressed picture data comprises means for variable length decoding said compressed picture data; and

wherein the means for changing a resolution of said decoded data comprises means, coupled to said inverse transforming means, for changing a resolution of said picture data by decreasing a size of said picture data to provide a lower resolution, further comprising:

means for selecting said picture data from one of said means for changing a resolution and said inverse transforming means;

means for decompressing data from said means for selecting to form frames;

means for omitting and inserting frames of said picture data from said means for decoding in a reverse reproducing operation;

means for changing an order of said picture data from said means for omitting and inserting in the reverse reproducing operation; and

a memory to temporarily store said picture data, coupled to said means for decompressing, said means for omitting and inserting and said means for changing.

5. An apparatus as claimed in claim 1, comprising:

means for receiving compressed picture data that is variable length encoded to estimate in frames/between frames and discrete cosine transformed and quantized;

means for variable length decoding said compressed picture data;

means for inverse quantizing said compressed picture data;

means, coupled to said means for inverse quantizing, for changing a resolution and inverse discrete cosine transforming said picture data by deleting a portion of pixel data of said picture data;

means for decompressing said picture data from said means for changing a resolution and inverse discrete cosine transforming to form frames;

means for changing an order of the frames of said picture data from said means for decompressing; and

a memory to temporarily store said picture data coupled to said means for decompressing and said means for changing.

6. A method for reproducing picture data, comprising the steps of:

decoding compressed picture data;

changing a resolution of said decoded picture data;

storing in a memory the picture data with changed resolution;

reproducing said picture data from said memory; and

controlling an order for reproducing said picture data from said memory.

7. A method for reproducing picture data as claimed in claim 6, further comprising the steps of:

receiving compressed picture data compressed by inter-frame prediction coding;

decreasing a size of said picture data by said step of changing the resolution;

omitting frames from said picture data from said changer of resolution;

changing an order of said picture data; and

selecting from one of said picture data of changed order and said decoded picture data, to reproduce said picture data.

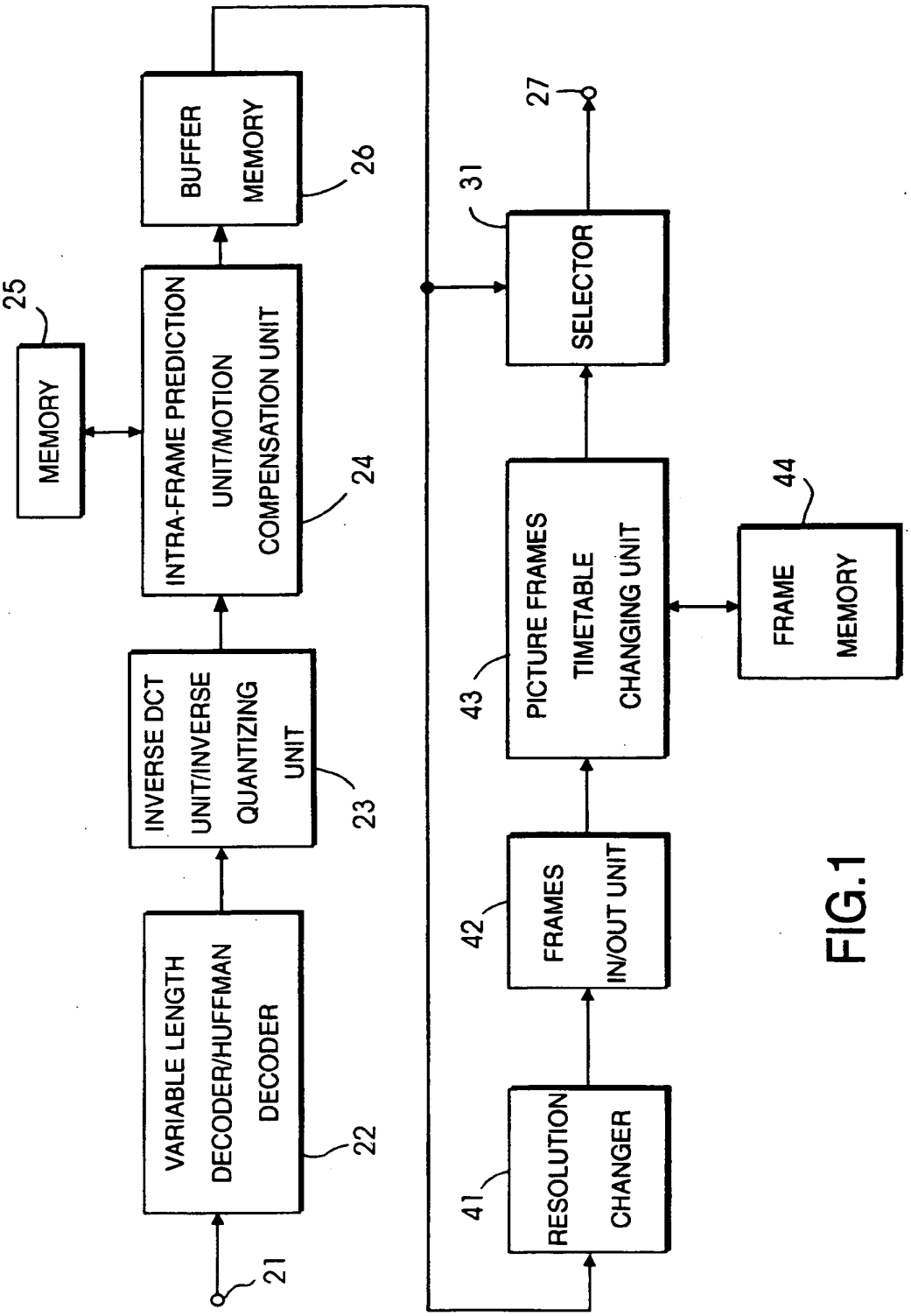

VARIABLE LENGTH DECODER/HUFFMAN DECODER
22
21
INVERSE DCT UNIT/INVERSE QUANTIZING UNIT
23
INTRA-FRAME PREDICTION UNIT/MOTION COMPENSATION UNIT
24
MEMORY
25
BUFFER MEMORY
26
27
SELECTOR
31
RESOLUTION CHANGER
41
FRAMES IN/OUT UNIT
42
PICTURE FRAMES TIMETABLE CHANGING UNIT
43
FRAME MEMORY
44

FIG.1

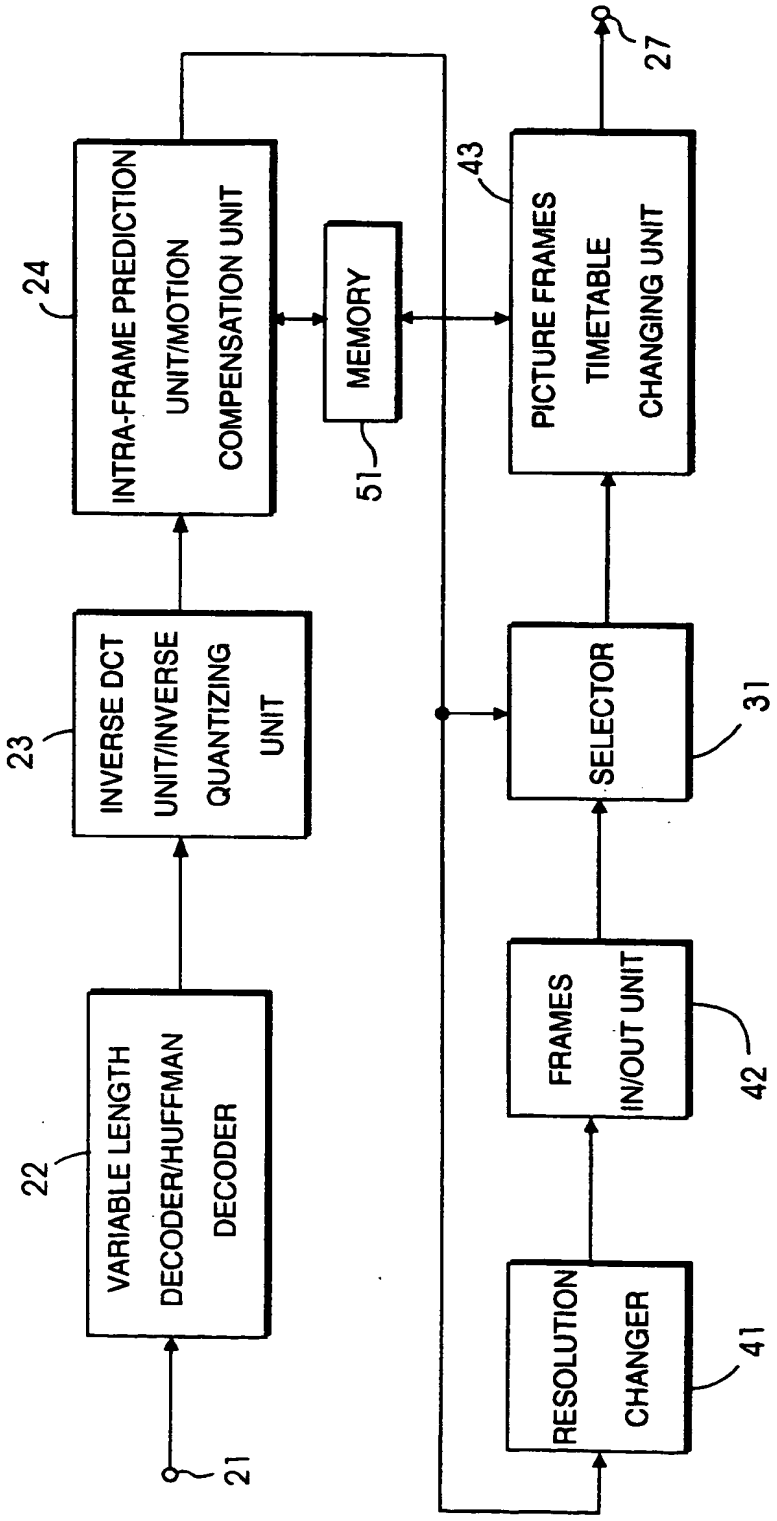
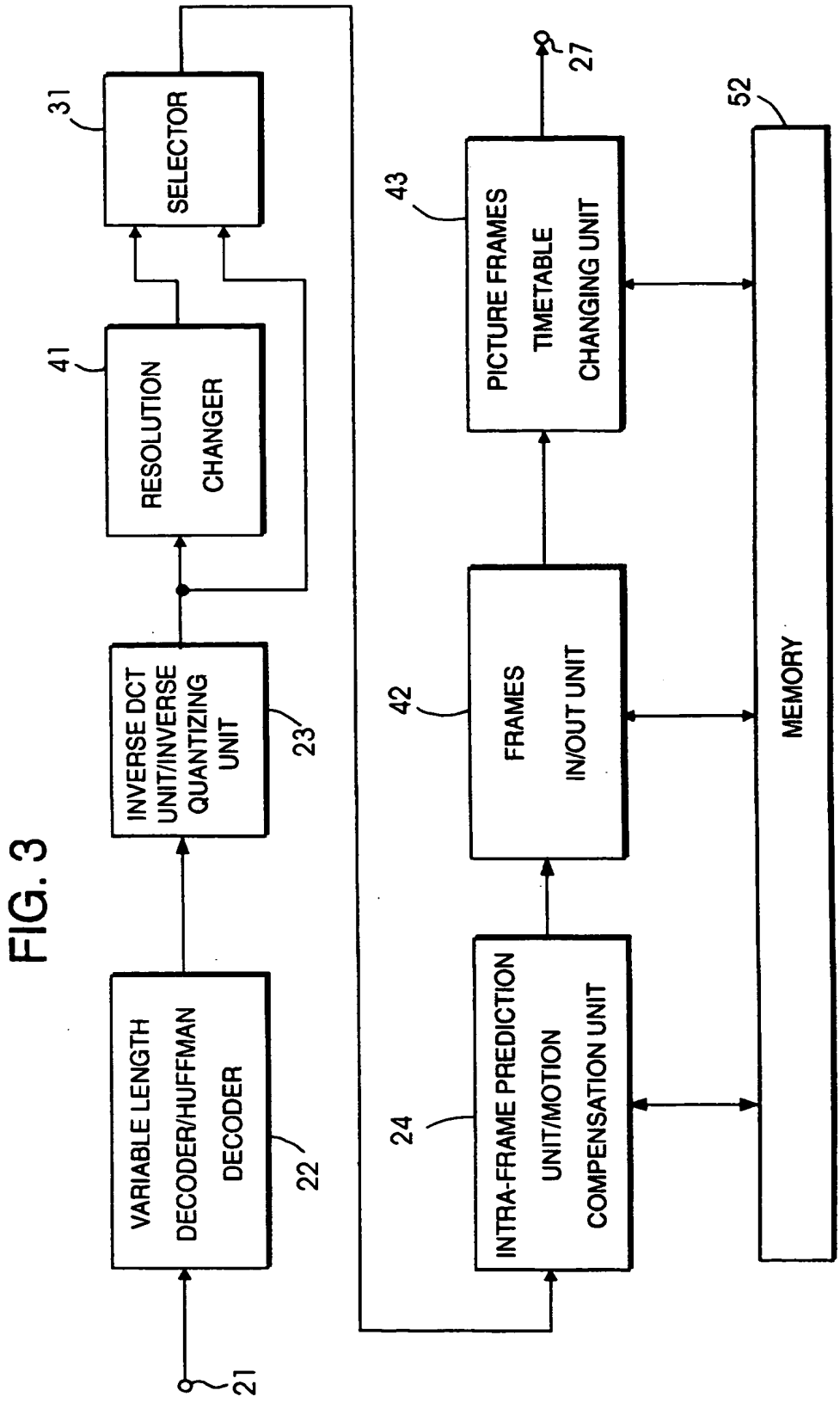

21
22
VARIABLE LENGTH DECODER/HUFFMAN DECODER
23
INVERSE DCT UNIT/INVERSE QUANTIZING UNIT
24
INTRA-FRAME PREDICTION UNIT/MOTION COMPENSATION UNIT
51
MEMORY
41
RESOLUTION CHANGER
42
FRAMES IN/OUT UNIT
31
SELECTOR
43
PICTURE FRAMES TIMETABLE CHANGING UNIT
27

FIG.2

FIG. 3


21
VARIABLE LENGTH DECODER/HUFFMAN DECODER
22
INVERSE DCT UNIT/INVERSE QUANTIZING UNIT
23
RESOLUTION CHANGER
41
SELECTOR
31
INTRA-FRAME PREDICTION UNIT/MOTION COMPENSATION UNIT
24
FRAMES IN/OUT UNIT
42
PICTURE FRAMES TIMETABLE CHANGING UNIT
43
27
MEMORY
52

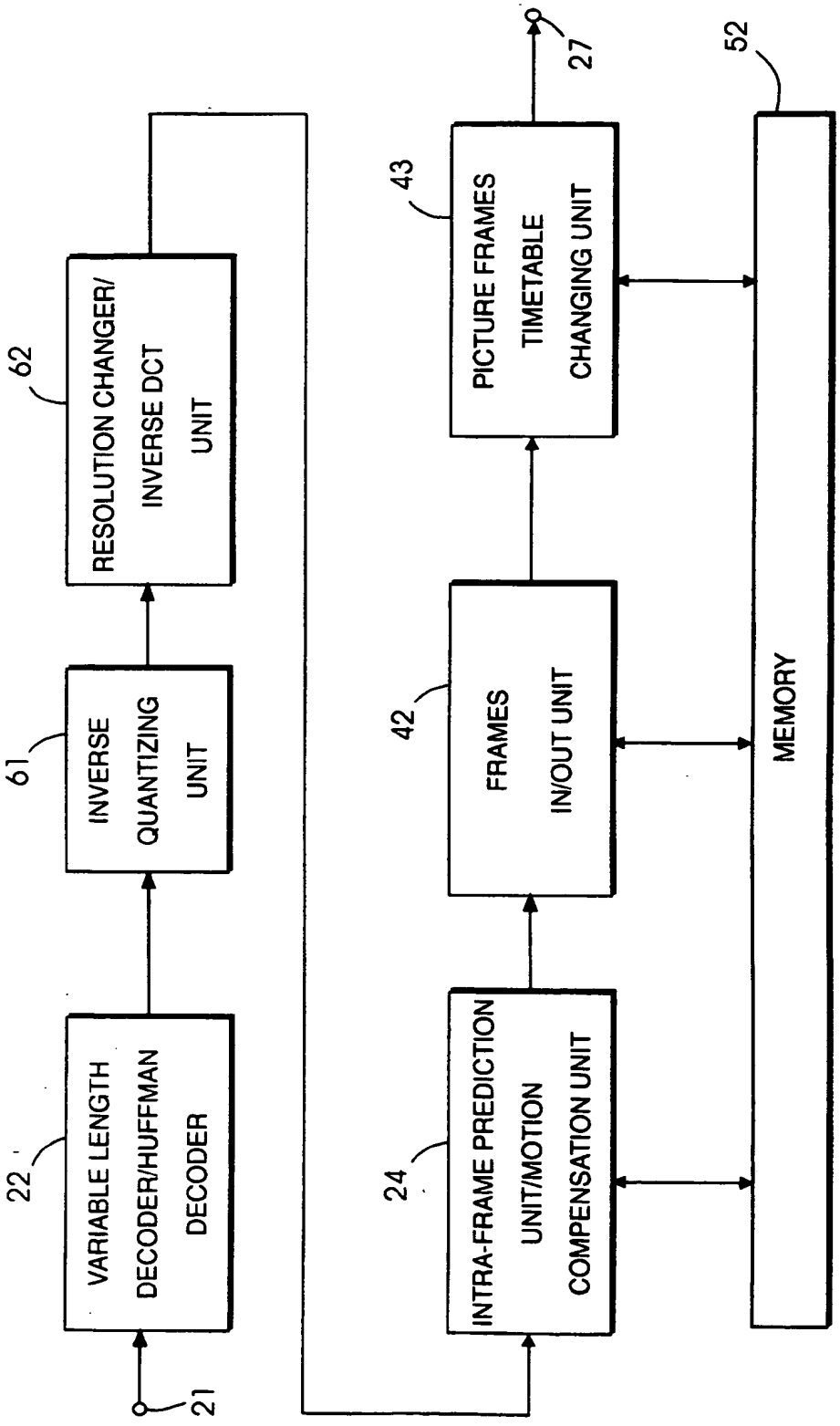

21
22
VARIABLE LENGTH DECODER/HUFFMAN DECODER
61
INVERSE QUANTIZING UNIT
62
RESOLUTION CHANGER/ INVERSE DCT UNIT
24
INTRA-FRAME PREDICTION UNIT/MOTION COMPENSATION UNIT
42
FRAMES IN/OUT UNIT
43
PICTURE FRAMES TIMETABLE CHANGING UNIT
27
52
MEMORY

FIG.4

FIG.5

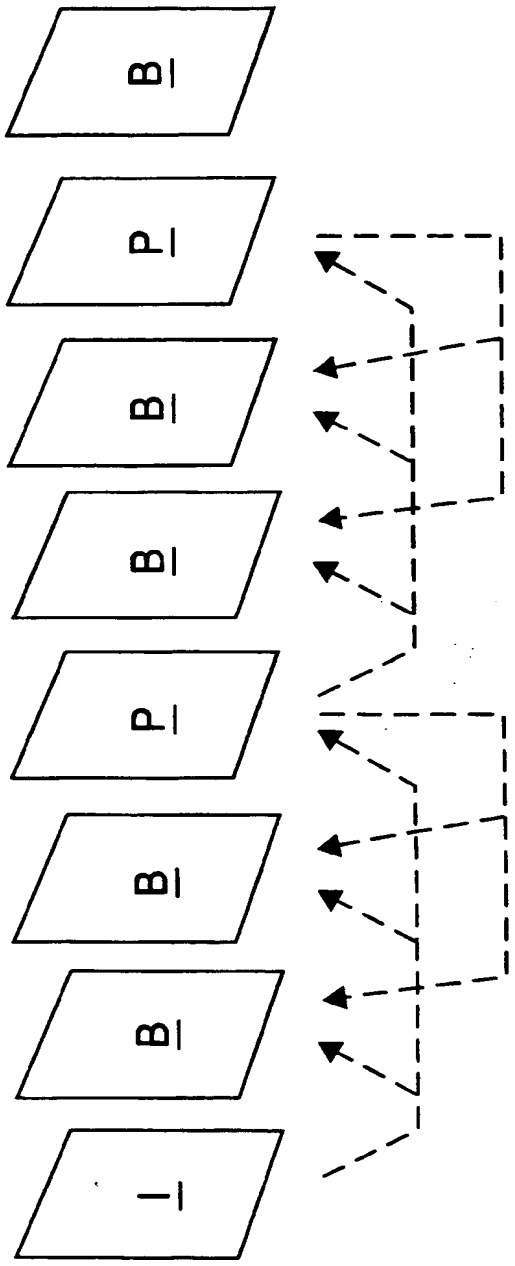
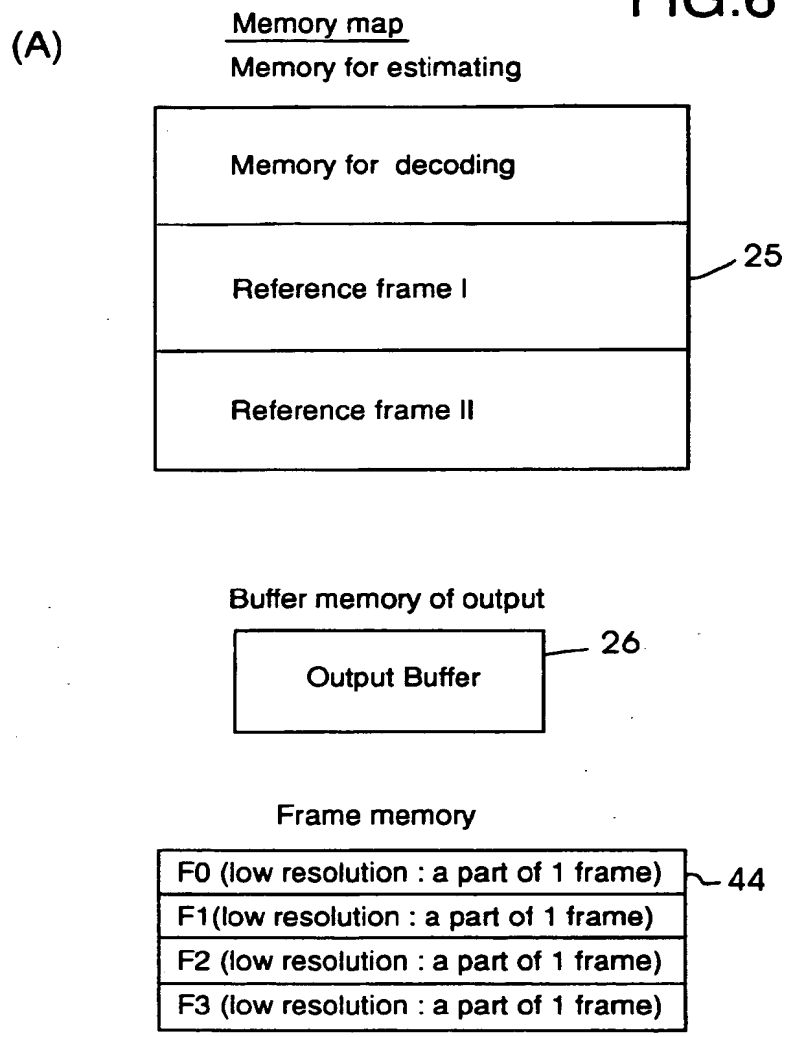


FIG.6

(A)


Memory map
Memory for estimating
Memory for decoding
Reference frame I
Reference frame II
25
Buffer memory of output
Output Buffer
26
Frame memory
F0 (low resolution : a part of 1 frame)
F1(low resolution : a part of 1 frame)
F2 (low resolution : a part of 1 frame)
F3 (low resolution : a part of 1 frame)
44

(B)

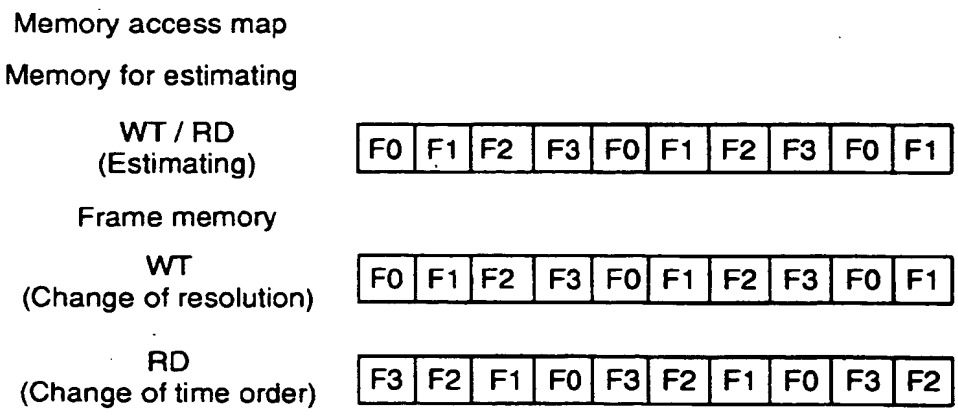

Memory access map
Memory for estimating
WT / RD
(Estimating)
F0 F1 F2 F3 F0 F1 F2 F3 F0 F1
Frame memory
WT
(Change of resolution)
F0 F1 F2 F3 F0 F1 F2 F3 F0 F1
RD
(Change of time order)
F3 F2 F1 F0 F3 F2 F1 F0 F3 F2

FIG.7

(A)

Memory map (Normal reproducing)	Memory map (Reverse reproducing)
Memory for decoding	Memory for decoding
Reference frame I	Reference frame I
Reference frame II	Reference frame II
Output memory	F0 (low resolution : a part of 1 frame)
	F1 (low resolution : a part of 1 frame)
	F2 (low resolution : a part of 1 frame)
	F3 (low resolution : a part of 1 frame)

(B)

Memory access map

(Normal reproducing)

WT / RD (Estimating)	F F F F F F F F F F
RD (Output picture)	F F F F F F F F F

(Reverse reproducing)

WT / RD (Estimating)	F0 F1 F2 F3 F0 F1 F2 F3 F0 F1
WT (Change of resolution)	F0 F1 F2 F3 F0 F1 F2 F3 F0 F1
RD (Change of time order)	F3 F2 F1 F0 F3 F2 F1 F0 F3 F2

FIG. 8

(A)

Memory map (Normal reproducing)

Memory for decoding
Reference frame I
Reference frame II
Output memory

Memory map (Reverse reproducing)

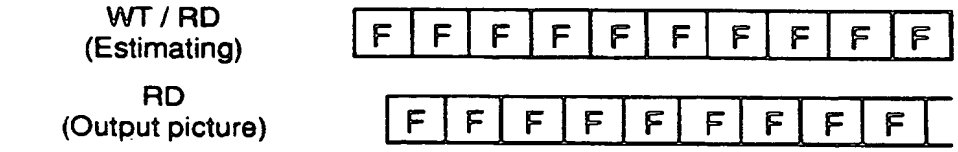
Memory for decoding
Reference frame I
Reference frame II
F0 (low resolution : a part of 1 frame)
F1 (low resolution : a part of 1 frame)
F2 (low resolution : a part of 1 frame)
F3 (low resolution : a part of 1 frame)
F4 (low resolution : a part of 1 frame)
F5 (low resolution : a part of 1 frame)
F6 (low resolution : a part of 1 frame)
F7(low resolution : a part of 1 frame)
F8 (low resolution : a part of 1 frame)
F9 (low resolution : a part of 1 frame)

When 1/4 resolution

(B)

Memory access map

(Normal reproducing)



(Reverse reproducing)

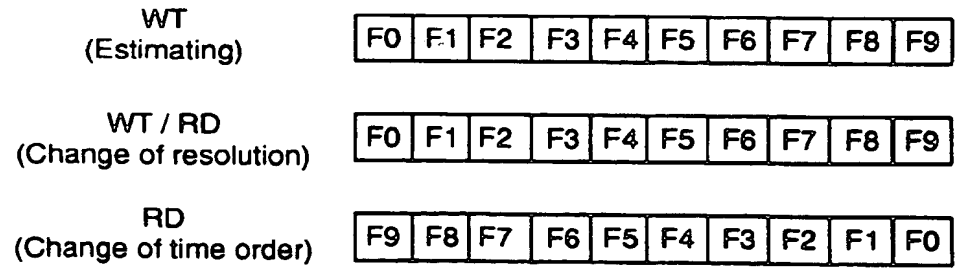
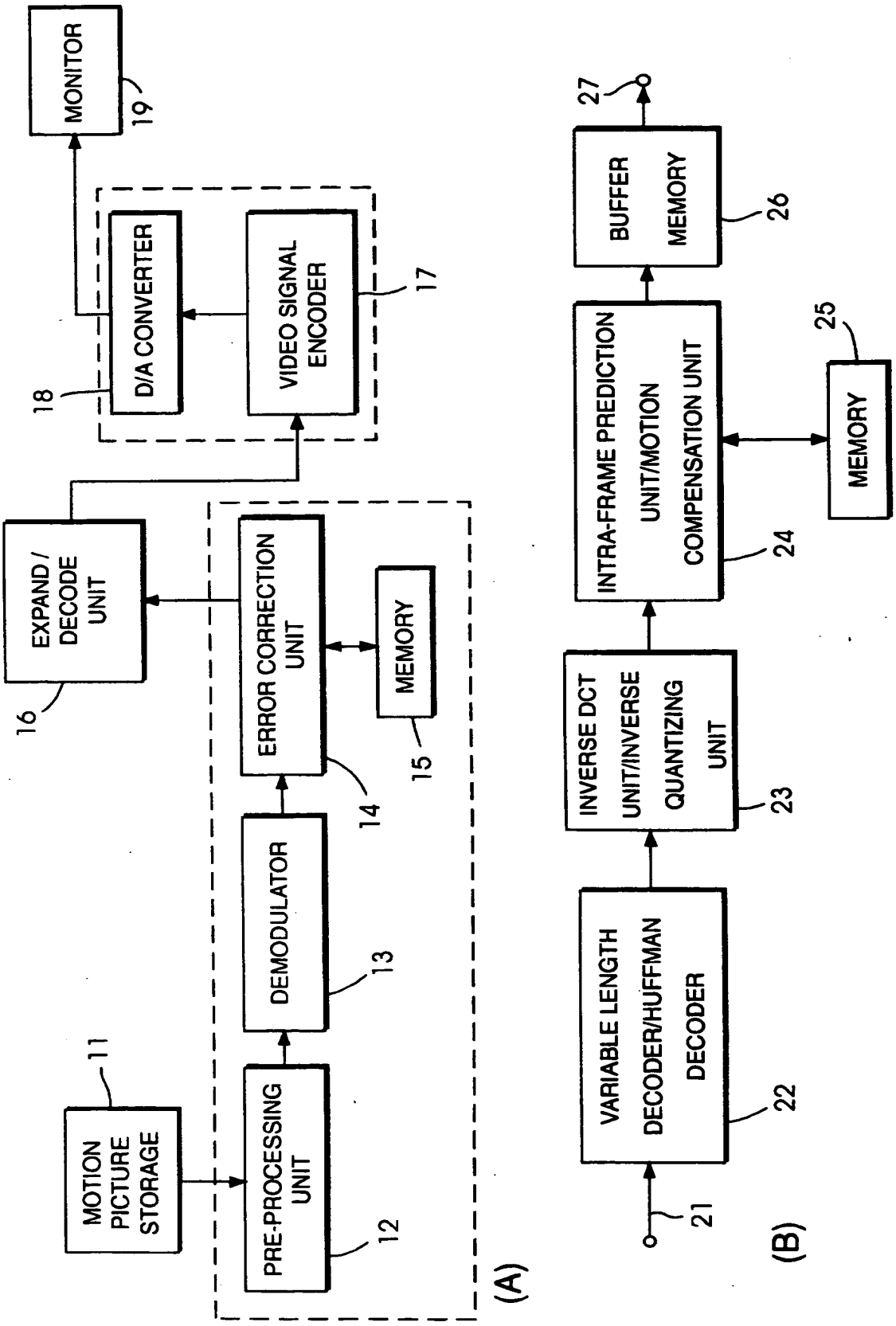


FIG.9


MONITOR
19
D/A CONVERTER
VIDEO SIGNAL ENCODER
17
18
EXPAND / DECODE UNIT
16
ERROR CORRECTION UNIT
MEMORY
15
14
DEMODULATOR
13
MOTION PICTURE STORAGE
11
PRE-PROCESSING UNIT
12
(A)
BUFFER MEMORY
26
27
INTRA-FRAME PREDICTION UNIT/MOTION COMPENSATION UNIT
24
MEMORY
25
INVERSE DCT UNIT/INVERSE QUANTIZING UNIT
23
VARIABLE LENGTH DECODER/HUFFMAN DECODER
22
21
(B)

(19) Europäisches Patentamt
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(54) Method and apparatus for reproducing picture data

(57) Apparatus for reproducing picture data includes a variable length decoder and Huffman decoder (22), an inverse discrete cosine transforming (IDCT) unit (23) coupled to the Huffman decoder, an intra-frame prediction unit and motion compensation unit (24) coupled to the IDCT unit, a memory (25) coupled to the intra-frame unit, a buffer memory (26) coupled to an output of the intra-frame unit, a resolution changer (41) coupled to the buffer memory, a frames in/out unit (42) coupled to the output of the resolution changer, a unit (43) for changing a timetable of picture frames coupled to the output of the frames in/out unit, a frame memory (44) coupled to the changing unit, and a selector (31) for selecting picture data for reproduction from the buffer memory or the changing unit.

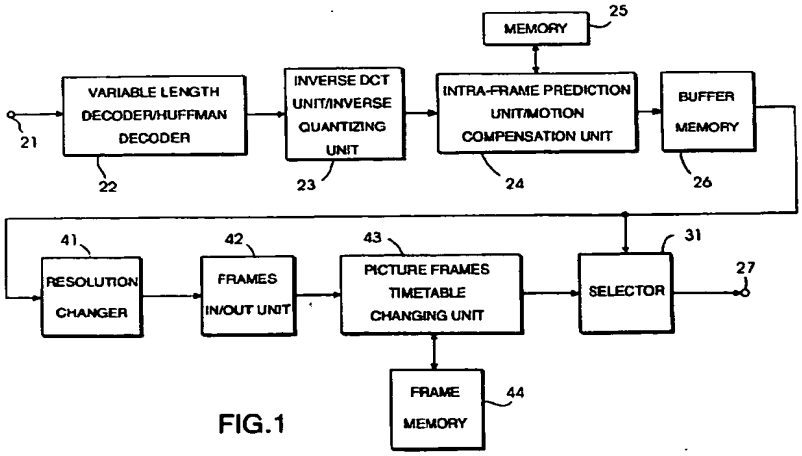

FIG.1

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EUROPEAN SEARCH REPORT

Application Number
EP 95 30 0909

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
P,X	EP-A-0 629 085 (MATSUSHITA ELECTRIC INDUSTRIAL CO. LTD.) 14 December 1994	1-3,6,7	H04N7/26 H04N5/937
A	* the whole document *	4,5	
A	EP-A-0 545 323 (SONY CORP.) * the whole document *	1-7	
A	PATENT ABSTRACTS OF JAPAN vol. 16 no. 143 (P-1335) ,9 April 1992 & JP-A-04 000574 (CANON INC.) 6 January 1992, * abstract *	1-7	
A	PATENT ABSTRACTS OF JAPAN vol. 16 no. 580 (P-1461) ,18 December 1992 & JP-A-04 229382 (RICOH CO LTD) 18 August 1992, * abstract *	1-7	
A	EP-A-0 510 640 (HITACHI, LTD) * the whole document *	1-7	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	SIGNAL PROCESSING IMAGE COMMUNICATION., vol. 2, no. 2, August 1990 AMSTERDAM NL, pages 155-169, XP 000243475 PEREIRA ET AL. 'A CCITT Compatible Coding Algorithm for Digital Recording of Moving Images' * page 158, paragraph 4; figure 2 * * page 160, paragraph 3.3.3 - page 161, paragraph 3.3.4 *	1-7	H04N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 January 1996	Foglia, P

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